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Sarkozy et al.

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[54] **APPARATUS AND METHOD FOR STORING DATA WITH SELECTABLE DATA PROTECTION USING MIRRORING AND SELECTABLE PARITY INHIBITION**

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[58] Field of Search ..... **711/112, 114, 711/113; 395/182.05, 182.04**

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

5,519,844 5/1996 Stallmo ..... 711/114  
5,546,558 8/1996 Jacobson et al. .... 711/114

**OTHER PUBLICATIONS**

Edited By Paul Massiglia The RAID Advisory Board, "The RAIDbook, A Source Book for Disk Array Technology" Fourth Edition, pp. 3-22 and pp. 114-153, Aug. 8, 1994. InfoWorld, "SuperFlex 3000 Provides Dynamic Growth" Product Review, v18, n25 p. N13, Jun. 17, 1996. DeVoe, Deborah Vendors to unveil RAID storage systems. (Storage Dimensions' Superflex 3000, Falcon Systems' Reeltime) (Brief Article), Infoworld, Mar. 25, 1996, v18 n13 p42 (1).

HP's Smart Auto-RAID Backup Technology Newsbytes, Aug. 4, 1995, pNEW08040012.

Crowthers, Edward and Leader, Joe; RAID technology advances to the next level; Computer Technology Review; Mar. 1996; v16 n3 p46.

Storage Dimensions, Fault-Tolerant Storage for Non-Stop Networks, Aug. 15, 1995, pp. 42-43.

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**[57] ABSTRACT**

A protection mechanism for use in a mass storage system for providing user selectable levels of protection against data loss wherein storage segments of a plurality of disk drives are organized into at least two functionally separate logical units and a memory management mechanism is responsive to an identification of a logical unit as selected for mirroring by writing a first copy of a data block assigned to a first storage address in a designated logical unit into the assigned storage address in the designated logical unit and writing a second copy of the data block into a second storage address in the disk drives wherein the second storage address is skewed with respect to the first storage address so that the second storage address is located in a disk drive separate from the data disk drive containing the first storage address, and writing at least one parity block containing parity information relating to the data block into a disk drive. The mechanism allows a user to select to write data blocks to the disk drives without corresponding parity information being stored in the disk drives, and to later enter the parity information.

**10 Claims, 7 Drawing Sheets**